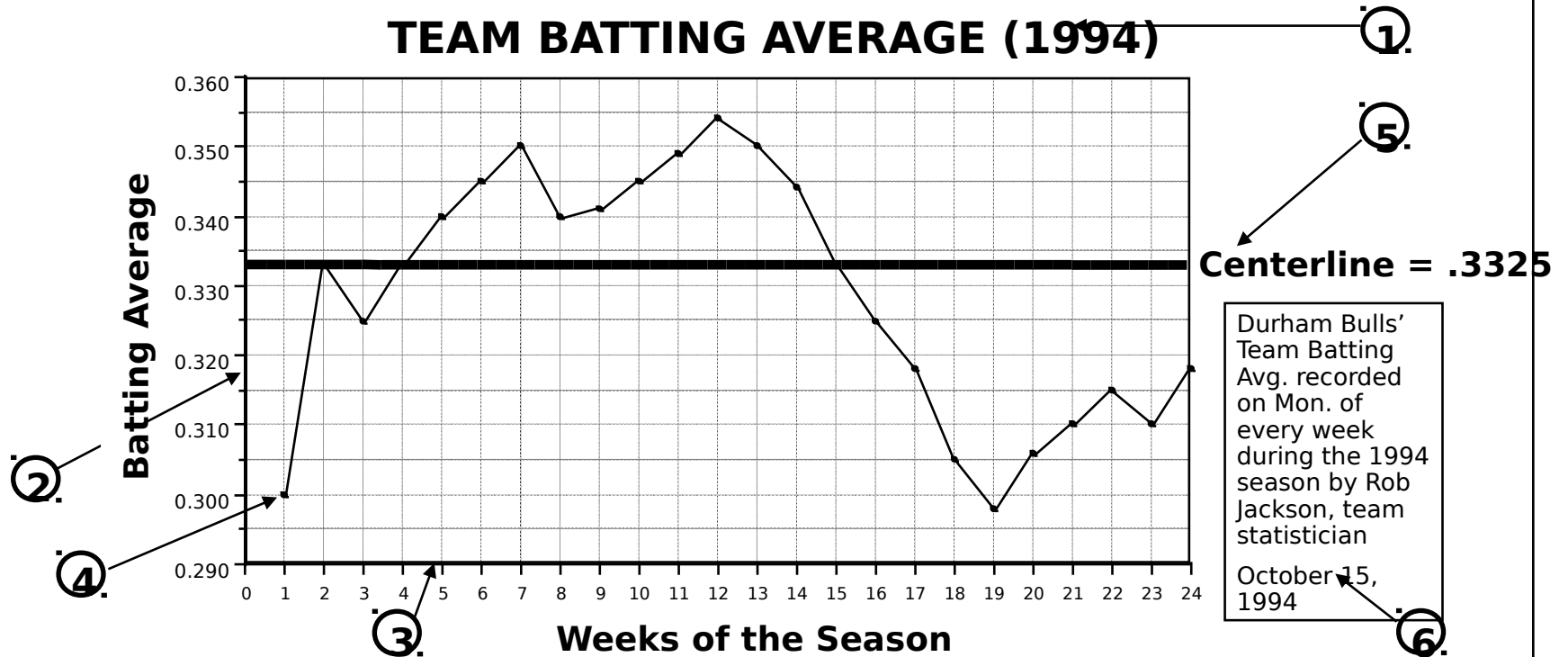# What is a Run Chart?

A line graph of data points plotted in chronological order that helps detect special causes of variation.

Why Use Run Charts?

- Understand process variation

- Analyze data for patterns

- Monitor process performance

- Communicate process performance

Parts of a Run Chart

TEAM BATTING AVERAGE (1994) ①

⑤

Centerline = .3325

Batting Average (Y-axis, values: 0.360, 0.350, 0.340, 0.330, 0.320, 0.310, 0.300, 0.290)

②

④

③

Weeks of the Season (X-axis: 0 through 24)

Durham Bulls' Team Batting Avg. recorded on Mon. of every week during the 1994 season by Rob Jackson, team statistician

October 15, 1994 ⑥

WEEK	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
AVG	300	333	325	332	340	345	350	340	341	345	349	354	350	344	333	325	318	305	298	306	310	315	310	318

⑦

①	**TITLE**	③	**X-AXIS**	⑤	**CENTERLINE**	⑦	**DATA TABLE**
②	**Y-AXIS**	④	**DATA POINT**	⑥	**LEGEND**		

How to Construct a Run Chart

Step 2 - Order data & determine range

Step 3 - Calculate the median

RANK	AVG	RANK	AVG	RANK	AVG
1	.298	9	.318	17	.341
2	.300	10	.325	18	.344
3	.305	11	.325	19	.345
4	.306	12	.332	20	.345
5	.310	13	.333	21	.349
6	.310	14	.333	22	.350
7	.315	15	.340	23	.350
8	.318	16	.340	24	.354

MEDIAN:
(.332 + .333) / 2
= .3325

RANGE: .354 - .298 = 0.56

How to Construct a Run Chart

Step 4 - Construct the Y-axis

Step 5 - Draw the Centerline
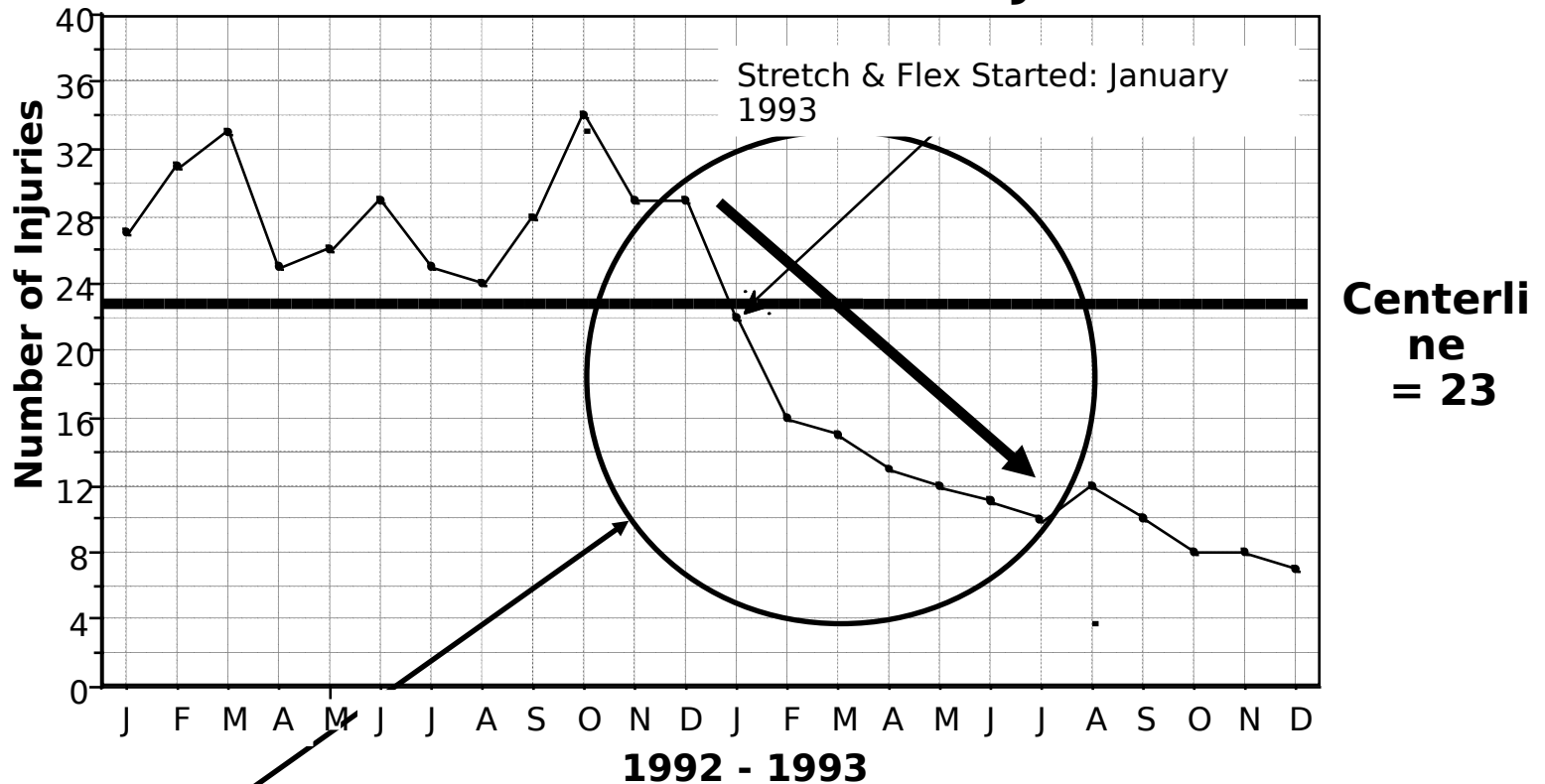
Step 6 - Construct the X-axis

Step 7 - Plot and connect the data points

Step 8 - Provide a title and a legend

Trend Example
MONTHLY REPORTED BACK INJURIES

Stretch & Flex Started: January 1993

Centerline = 23
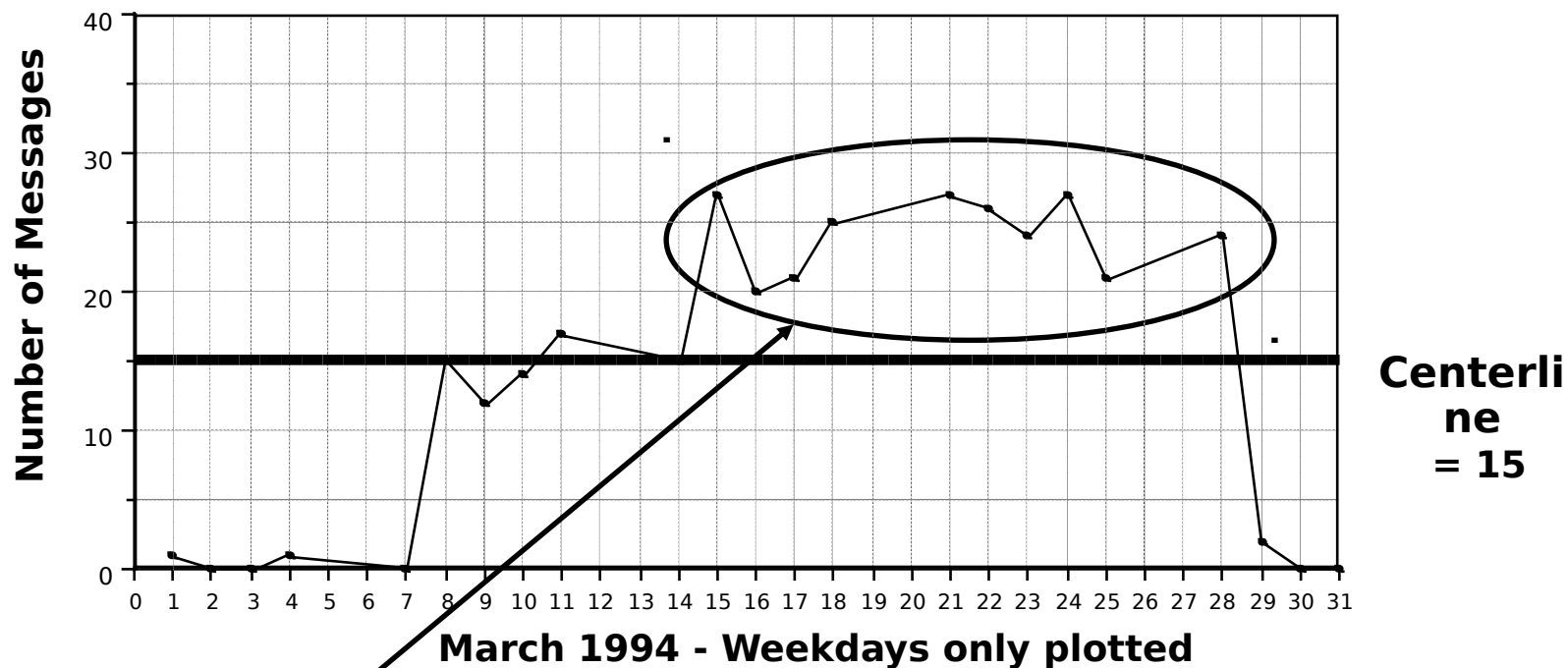
Number of Injuries

1992 - 1993

Signal of special cause variation: 7 or more consecutive ascending or descending points

Data taken from OSHA Reports and CA-1 forms by Bob Kopiske. Compiled and charted on 15 January 1994.
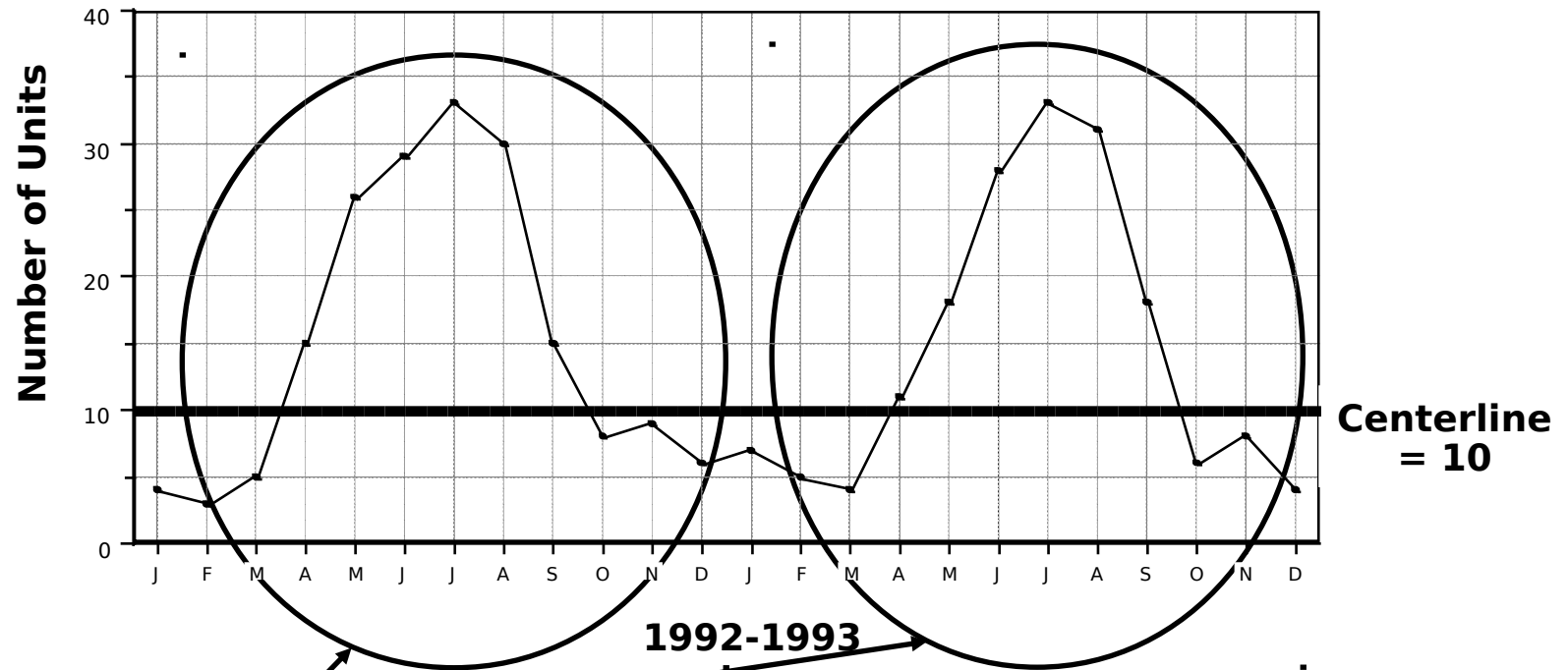
Run Example

DUPLICATE MESSAGES

Centerline = 15

March 1994 - Weekdays only plotted

Signal of special cause variation: 9 or more consecutive data points on the same side of the centerline

Data taken from manual daily count of incoming messages, entered on checksheet by L. Zinke, NAVEUR Fleet Quality Office.

Cycle Example

HOUSING MOVE-OUTS

1992-1993

Centerline = 10

Signal of special cause variation: Repeating patterns

Data from Housing Office records for 1992-93. Compiled and charted on 1 FEB 94 by Gail Wylie.
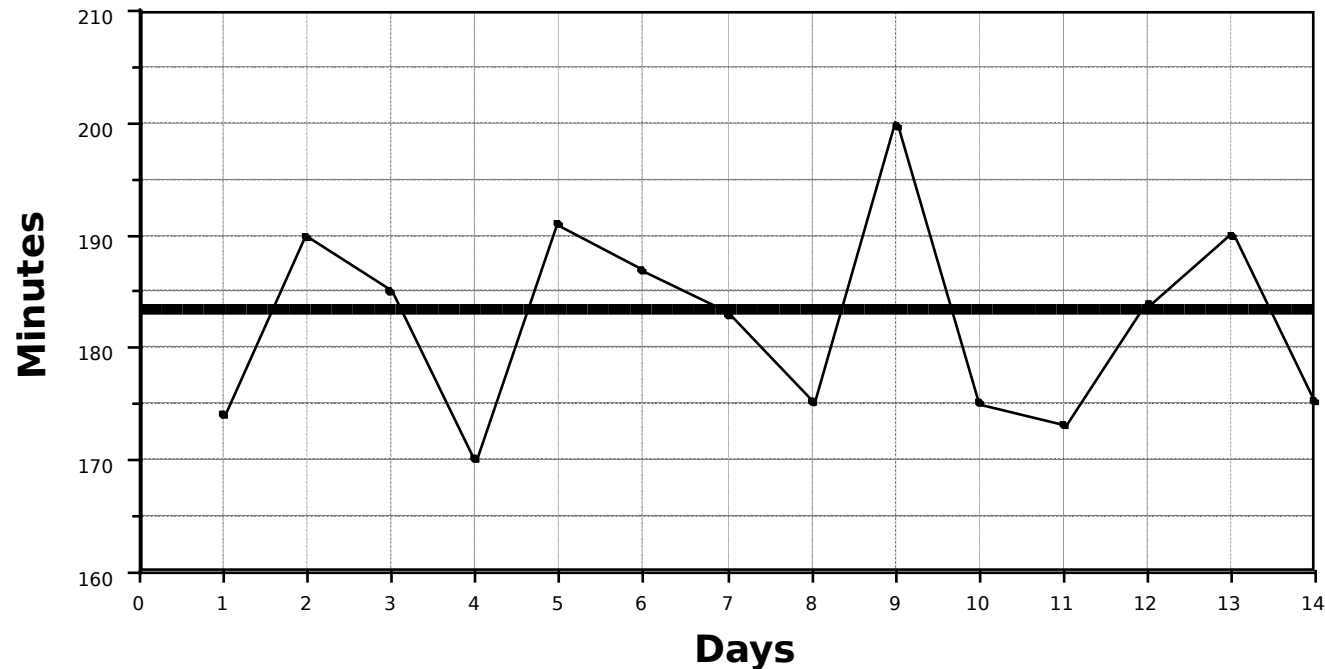
EXERCISE 1A DATA
Overhaul Times
First 14 Valves

VALVE	1st	2nd	3rd	4th	5th	6th	7th
TIME	174	190	185	170	191	187	183
DAY	1	2	3	4	5	6	7

VALVE	8th	9th	10th	11th	12th	13th	14th
TIME	175	200	175	173	184	190	175
DAY	8	9	10	11	12	13	14

EXERCISE 1A RUN CHART
First 14 Valves

Centerline = 183.5

Valve	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th
Time	174	190	185	170	191	187	183	175	200	175	173	184	190	175
Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14

EXERCISE 1B DATA
Overhaul Times
Second 14 Valves

VALVE	15th	16th	17th	18th	19th	20th	21st
TIME	165	140	125	110	108	105	100
DAY	15	16	17	18	19	20	21

VALVE	22nd	23rd	24th	25th	26th	27th	28th
TIME	95	108	115	120	105	100	95
DAY	22	23	24	25	26	27	28

EXERCISE 1B
Centerline Calculations

Old Process

Ends

Starts

1	2	3	4	5	6	7	8	9	10	11	12	13	14
200	191	190	190	187	185	184	183	175	175	175	174	173	170

Centerline (184 + 183)/2 = 183.5

New Process

Ends

Starts

15	16	17	18	19	20	21	22	23	24	25	26	27	28
165	140	125	120	115	110	108	108	105	105	100	100	95	95

Centerline (108 + 108)/2 = 108

EXERCISE 1B RUN CHART
All 28 Valves

Centerline = 183.5

Centerline = 108

TREND
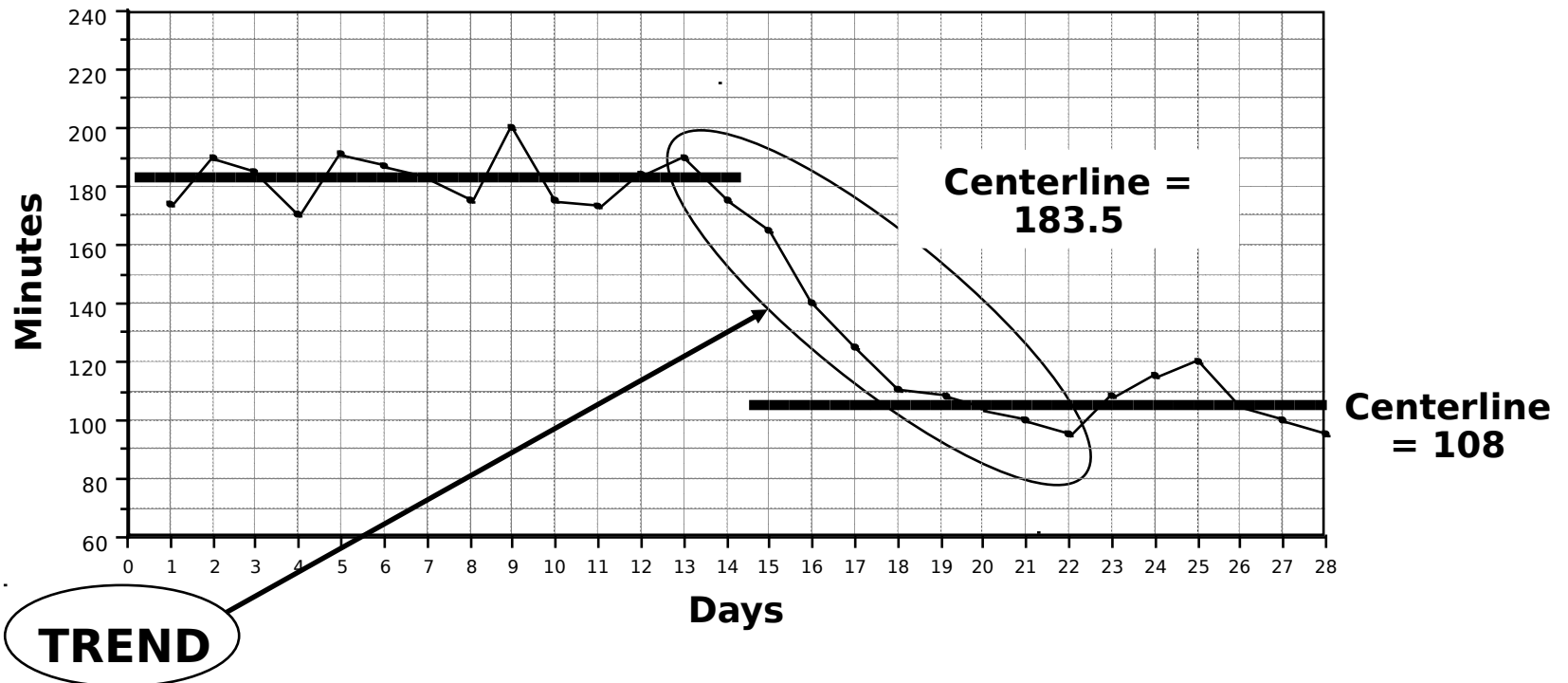
Valve	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	15th	16th	17th	18th	19th	20th	21st	22nd	23rd	24th	25th	26th	27th	28th
Time	174	190	185	170	191	187	183	175	200	175	173	184	190	175	165	140	125	110	108	105	100	95	108	115	120	105	100	95
Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28

EXERCISE 2 DATA
Minutes to Start Engine
First 10 Drills

DRILL	1st	2nd	3rd	4th	5th
TIME	15.3	12.1	14.4	16.8	17.3

DRILL	6th	7th	8th	9th	10th
TIME	16.6	14.2	12.0	11.3	13.9

EXERCISE 2 DATA
Minutes to Start Engine Second 10 Drills

DRILL	11th	12th	13th	14th	15th
TIME	8.1	7.6	7.2	5.1	4.4

DRILL	16th	17th	18th	19th	20th
TIME	4.0	2.6	2.2	4.5	5.3

EXERCISE 2 RUN CHART
Minutes to Start Engine
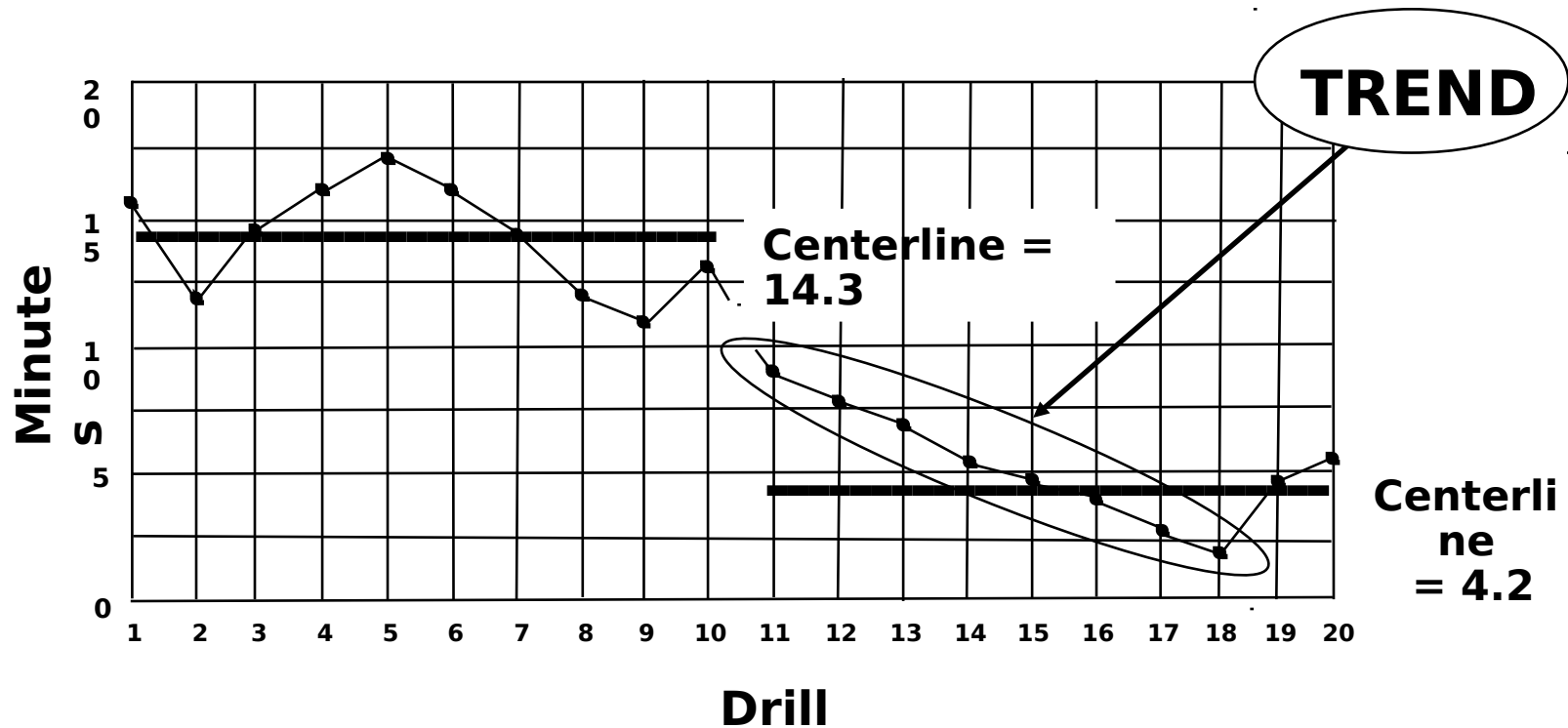
Drill	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	16	17	18	19	20										
Time	15 .3	12 .1	14 .4	16 .8	17.3	16 .6	14.2	12 .0	11.3	13 .9	8 .1	7.6	7.2	5 .1	4 .4
	4.0	2.6	2.2	4.5	5.3										